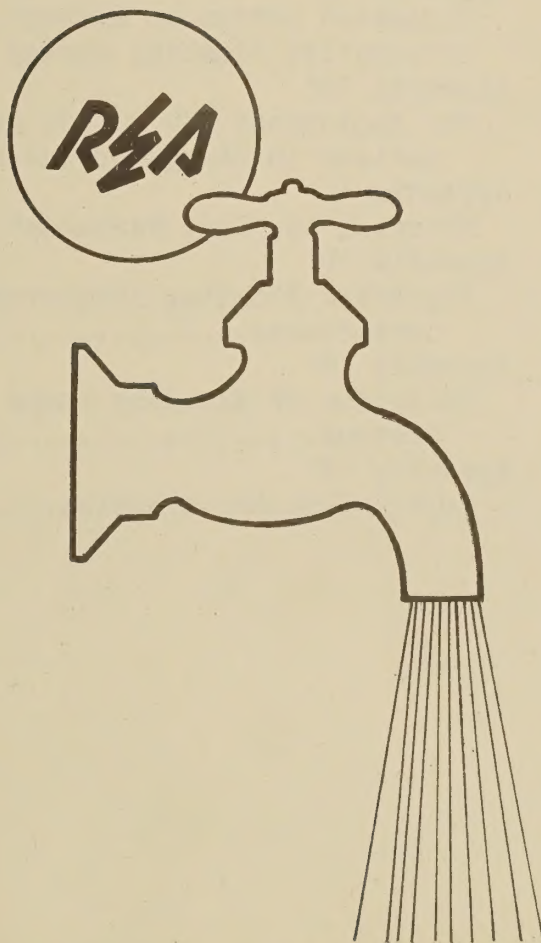

A PLUMBING PROGRAM

FOR THE
REA FINANCED COOPERATIVE



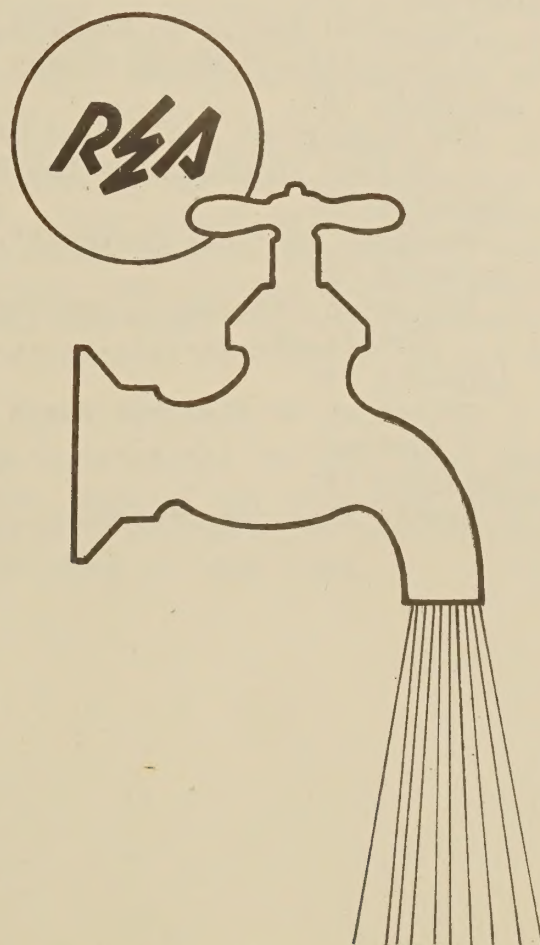
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A PLUMBING PROGRAMFor the REA Financed CooperativeEVERY REA-FINANCED COOPERATIVE NEEDS A PLUMBING PROGRAM

The need for electric water systems and complete plumbing is almost as universal as is the need for electricity itself. The Rural Electrification Administration believes that no rural electrification program is complete until each consumer of electricity has been helped to make most efficient use of his electricity consistent with his own needs and that no REA borrower has done a thorough job until it has brought each and every consumer a practical opportunity to have the benefits of running water.

THOROUGH, CAREFUL ORGANIZATION IS ESSENTIAL TO A SUCCESSFUL PROGRAM

To be thoroughly effective, the cooperative's plumbing program must be thoroughly organized and as diligently carried out as was the original rural line construction program. Half-hearted programs and programs that are treated as more or less incidental to other activities will be of limited value to borrowers and to their consumers.

A cooperative's plumbing program differs in important aspects from some of the other phases of the over-all power use program. It is most similar to the wiring program. Stimulating a readiness on the part of members to participate and getting active cooperation from suppliers of equipment is only part of the job. Like the wiring program, it is equally important that members be guided in getting the correct materials and in having these correctly installed. This cannot be left to chance. Mistakes in planning and installing water and plumbing systems result in contaminated water supplies, disease, undesirable odors in houses and other buildings, annoying noises, improperly functioning equipment, inconvenience, short life of equipment, and failure to get maximum benefits.

The procedure outlined here is given as a guide. It will need adaptation to the local situation. However, each of the suggested steps should be carefully considered since they are based on past experiences of REA-financed cooperatives with programs of this type.

While the program suggested here involves close supervision of installations and, at times, having the cooperative act as agent for its members in contacts with suppliers of equipment and with workers, it does not involve merchandising by the cooperative or the installing of equipment by the cooperative. It gives all suppliers of equipment and all qualified workers an opportunity to participate to the extent that the best interests of the cooperative's members are served. In order to simplify the work of the cooperative, it provides that the cooperative shall select a limited number of styles of equipment that will aggressively be sold to members. For example, two styles of bath tubs, two styles of lavatories, two styles of water closets, three styles of kitchen sinks, and one style of laundry tubs might be selected. These would be selected with due consideration to the needs and standards of living in the area served by the cooperative. In most cases, neat, modest, equipment would be selected. A member wanting luxury type equipment would then negotiate individually with his dealer.

The sale of equipment to members by "Unit Packages" is especially important. This is comparable in some ways to selling wiring by the outlet. The conventional method of selling plumbing by figuring each separate fitting and minute detail for each individual installation is excessively expensive whether done by the cooperative or by the dealer, and is one of the causes of high cost in modern plumbing. To reduce the high cost, some cooperatives with pre-war programs worked out "Unit Packages" similar to those described here.

If a plumbing program is to be of greatest benefit to a cooperative and its members, it will be necessary that a qualified employee be given specific responsibility for it. It will require a great deal of his time. This work will normally be part of the electrification adviser's responsibility. His qualifications, his other work, and the size of the program will be determining factors in whether he will need an assistant.

While materials are scarce, substantial savings in the costs of installations may depend on maximum home contributions rather than on large discounts in the prices of purchased materials. Programs initiated while materials are scarce should be planned to take full advantage of large price discounts that may become available when materials become plentiful. The past experiences of some cooperatives have indicated that maximum discounts are obtained by "Group Purchasing" in large quantities.

COORDINATE ACTIVITIES WITH OTHER AGENCIES

Various agencies, particularly the Agricultural Extension Service, for years have promoted water system and sewage disposal programs in many states and counties of the country. In areas where these programs exist, every practical effort should be made to coordinate the cooperative's program with these existing programs. In most counties participation in the program by the members of the cooperative should be at least doubled if the active cooperation of the County Agricultural Agent and the County Home Demonstration Agent is obtained.

The teachers of Vocational Agriculture in the schools throughout the cooperative's territory may be a powerful source of help. Most of them teach both regular classes and out-of-school classes in special subjects. Some of them have excellent shops and would welcome an opportunity to give special instruction in building well curbs, installing pumps, putting in water piping, installing fixtures, installing waste disposal piping, building septic tanks and septic tank disposal fields, etc. Don't overlook these sources of cooperation and help. Sometimes it may be to the cooperative's advantage to provide certain tools needed by teachers of Vocational Agriculture in teaching work of this type.

The following pages of this manual are divided into two parts. The first part, WHAT TO DO, is a suggested step-by-step procedure for the cooperative in organizing and carrying out a plumbing program followed by a group of miscellaneous, pertinent, detailed suggestions. The second part is a group of appendices designed to give the cooperative detailed technical aid in the program. The electrification adviser, or other cooperative employee in direct charge of the plumbing program, will need far more technical information than is given here. However, the information in these appendices will be of considerable help.

WHAT TO DO

A. The Manager Organizes the Program:

1. Consult with the Board of Directors and with County Agricultural Agents, County Home Demonstration Agents, teachers of Vocational Agriculture, teachers of Vocational Home Economics, and other farm leaders in the territory served by the cooperative.
2. The Board of Directors will formally approve the program and, if desirable, apply to the REA for funds to finance plumbing installations. This action should be given

appropriate newspaper and other publicity. This publicity should point out that it is a long range program designed to provide the convenience and sanitation of water and plumbing systems on as broad a scale as electricity.

3. Contact state, county and local health authorities. Get their cooperation, and copies of their rules, regulations and recommendation. Determine the assistance they are in a position to give, and use this assistance throughout the program.
4. Make a complete survey by mail of the members of the cooperative to locate those who are ready to participate immediately in the program. Accompany the survey blank, which is to be returned to the cooperative's office, with a circular letter explaining the program. (See APPENDIX 'A' for a suggested letter to members and a suggested survey form.) It may be desirable to hold a few community meetings to secure additional information to supplement the information obtained from the survey. If possible, hold these meetings in cooperation with County Agricultural Agents and County Home Demonstration Agents.
5. Concurrent with the rest of the program, endeavor to have all educational agencies conduct campaigns on the desirability of water and sewage disposal systems.
6. Appoint a qualified employee or hire a qualified person as electrification adviser in charge of the plumbing program. If the program is to succeed, it will require far more attention than the manager will have time to give to it. The full time of a well qualified person may be essential. It is not necessary that this employee be an experienced plumber, but he should be familiar with plumbing installations and farm water systems. He must be capable of dealing with the members of the cooperative, with farm leaders, with plumbers and service men, and with dealers and suppliers as well as handling the office work that goes with the program. He must be sympathetic with the program and with the cooperatives other activities. It would be helpful if he were capable of giving instructions on the installation of plumbing. (See APPENDIX 'B' for the specific desirable qualifications of the electrification adviser in charge of the plumbing program.)
7. Have the electrification adviser in charge of the plumbing program carry out the rest of the program under the general direction of the manager.

Determine The Availability Of Suitable Workmen, Materials and Equipment.

1. Contact local plumbers throughout the territory served by the system to determine their ability to make the installations, their willingness to cooperate, and whether they will work on terms that are fair to the cooperative's members. Cooperatives' past experiences indicate that few urban plumbers will participate. If qualified plumbers are not readily available under satisfactory conditions, make immediate plans for training men to do the necessary work. Help in this may be available from the State Extension Agricultural Engineer through the County Agricultural Agent, or from teachers of Vocational Agriculture. Interested dealers and jobbers may be of considerable assistance in locating and training qualified men.
2. Prepare preliminary "Unit Packages" of materials and make preliminary selection of types of equipment to be offered. (See APPENDIX 'C' for suggested "Unit Packages.") The prevalent types of construction of houses in the area served by the cooperative, local and state regulations, and the recommendations of local and state health authorities are factors that may make it desirable to change some of the "Unit Packages," as set up in APPENDIX 'C'. Local conditions may also make it desirable to eliminate some of the suggested "Unit Packages" and to add others. The selection of types of equipment to be offered may consist of picking out items by catalog number from a catalog of a well-known supplier of equipment, and stating that these items and their equivalents as furnished by other suppliers are the ones being considered. All of the large manufactureres substantially duplicate most of the equipment of other manufacturers so that selections designated by catalog number from one catalog and calling for substantially their equivalents will give all suppliers equal opportunity.
3. Call a conference with dealers, jobbers, and distributors of equipment. Explain the program to them. Make sure that they understand that the cooperative has no intention of entering the merchandising field in competition with them. See that they understand the "Unit Package" plan. Discuss with them the availability of materials, the qualities and quantities of materials available, the promptness of deliveries, prices, etc. Don't overlook minor but essential items such as traps, faucets, soil pipe, pipe fittings, sink strainers, frost-proof hydrants, etc. Discuss the possibilities

of discounts which may be available because the cooperative has taken over much of the "selling" job. Get their cooperation with the program.

4. Prepare the final "Unit Packages" of materials and make final selection of equipment to be offered. The conference with dealers, jobbers, and distributors of equipment may have brought out suggestions for improvement of the preliminary "Unit Packages" and the preliminary selections.
5. Submit copies of the final "Unit Packages" and final equipment selections to all interested suppliers. Ask them to furnish schedules of prices on the "Unit Packages" based on the equipment selections. Obtain quantities of illustrated sales literature from those suppliers that submit price schedules.

C. Conduct An Installation Campaign:

1. Start an installation campaign adjusted to the volume of materials available and to expected rates of delivery of these materials. The cooperative should see that each member plans his water and plumbing system for most desirable and efficient use, that he places a correct order for materials and equipment, and that the system is correctly installed. This will be greatly simplified by the use of "Unit Packages" of materials. If these "Unit Packages" have been carefully selected and adjusted to the area served by the cooperative, different combinations of them can be found which will fit most if not all of the homes that will be involved. Even if they do not exactly fit the needs of a particular home, the buying of materials will be greatly simplified if "Units" that nearly fit are bought and supplemented by local purchase of the few extra pieces of pipe or the few extra fittings that are required.
2. Submit orders for "Unit Packages" and other necessary materials to suppliers as fast as they are received from members. Have suppliers make deliveries direct to members premises.
3. When the first materials are delivered, set up demonstration installations. These demonstrations should be under the individual direction of the electrification adviser. They will serve the dual purpose of interesting more rural people in plumbing installations and teaching them that they can do much of the work on their own installations. They may also be used to train local men to make complete installations, and for the purpose of showing what is required and what is recommended in plumbing and water systems.

4. Continue throughout the duration of the program to use these demonstration installations as places for educational meetings.

D. Inspect Each Installation. Continue The Installation Campaign. Use Experience To Improve The Program.

1. Have each installation thoroughly inspected by the electrification adviser or a qualified inspector. (See APPENDIX 'D' for a suggested inspection report.) The REA recommends that the Board of Directors adopt MINIMUM PLUMBING REQUIREMENTS FOR INSTALLATIONS FINANCED WITH REA FUNDS (Form AL-73) as the minimum standards for the inspection of all installations unless state or local regulations provide higher standards. Keep a file of inspection records in the cooperative's office. This inspection will assure the member of a satisfactory sanitary installation, and is especially important to the cooperative in those installations which are financed with REA funds. A plumbing system cannot be repossessed as can some types of equipment. This makes it necessary for the cooperative to assure itself that there is full value in the installations for the money loaned and that no health hazards have been created by them.
2. Throughout the entire program, emphasize the use of farm labor and local materials wherever they are satisfactory. This should result in considerable cash savings to members, and the participation of the members in any activity of the cooperative increases their interest in all of its activities.

E. Consider The Following Suggestions In Organizing And Conducting The Program.

1. Use your own good practical judgement throughout this program. This outline will help you, but may not exactly fit your situation.
2. A plumbing committee appointed by the Board of Directors may be desirable in guiding the program.
3. Obtain assistance from every possible source. Enlist the aid of all educational agencies, particularly the Agricultural Extension Service and teachers of Vocational Agriculture with their training shops. Do not overlook the Portland Cement Association as a source of assistance with well curbs, pump bases, and sewage disposal systems. Solicit the help of health authorities wherever they may assist. The County Sanitarian may be willing to act as the plumbing inspector for the cooperative.

4. The plumbing program should be promoted on the basis of its worth to the members rather than as another item of load on the electric line.
5. It may be desirable to provide contract forms for use by the member and his plumber. Such forms might specify that 75 per cent of the cost would be paid on completion of the work and the remaining 25 per cent paid when the installation has passed inspection.
6. Remember that well organized publicity is essential to success.
7. Conduct essay and poster contests among school children, 4-H Clubs, Future Farmers of America, and other groups as a means of arousing interest and cooperation. Various individuals or groups may offer prizes in such contests.
8. Keep accurate records in the cooperative's office of all phases of the program - orders placed, delivery of materials, completion of each installation, inspection reports, assignment of workers, assignment of tools, costs of labor and materials, etc.
9. Consider training returned members of the armed services and men who have been doing wiring for the installation of water systems and plumbing.
10. The location, number, and use of demonstrations might be determined cooperatively with County Agricultural Agents, Home Demonstration Agents and other rural leaders.
11. Encourage complete installations. When partial installations are made, see that they are planned and put in so that they can later be completed by merely adding to rather than by tearing out and replacing parts of the system already installed.
12. Use caution in recommending the use of metal septic tanks. Most of them are too small. Small size is a major cause of septic tank troubles. The smallest size used should have a "liquid" capacity of 500 gallons. They should conform in size, shape, and dimensions to the recommendations of the U. S. Public Health Service as published in Reprint No. 2461, "Rural Sewage Disposal." Experience with pipe-lines indicates that certain soils cause rapid deterioration of buried steel even when it is well coated with protective materials.
13. Consider providing removable forms for concrete septic tanks to be loaned or rented to members.
14. Consider using locally produced precast concrete septic tanks if they are available at reasonable prices.

15. Consider providing tools to be rented to members for making their installations and to be loaned to teachers of Vocational Agriculture and others for teaching purposes.
16. Consider local production of concrete tile for use in the sewage disposal fields. One cooperative, before the war, made 4 inch tile and delivered it to its members at $2\frac{1}{2}$ cents per foot.

APPENDIX 'A'

SUGGESTED LETTER TO MEMBERS

(To Be Mimeographed for Distribution)
(Cooperative's Letterhead)

Dear Member:

From time to time, many of you have asked your cooperative's officials about the possibilities of getting water pumps and plumbing systems for your homes. Your cooperative now has a plan for aiding you in getting the necessary materials and helping you with the installation so that you can get a complete plumbing system.

Demonstrations will be set up on farms throughout the area served by your cooperative. At these demonstrations you may assist in the actual installation of a complete system under the direction of a competent plumber and thus learn how to do much or all of the work on your own system. Local workers will also be trained at these demonstrations who will be available to help you.

By doing much or all of your own work you will be able to reduce the cost of your system considerably, but, of course, you will be free to hire a plumber to make your complete installation for you, if you wish.

Materials will be available for both simple and elaborate systems.

Your cooperative has made arrangements to finance up to _____ per cent of the cost of your installation over a period up to _____ years. The interest rate is 4% simple interest. This financial assistance will be available to you either if you buy your materials with your cooperative's assistance, or if you buy from a source of your own choosing.

If you are interested in participating in this program, fill out and return the enclosed survey card. It does not obligate you.

Very truly yours,

Manager

Enclosure

COOPERATIVE PLUMBING SURVEY
(To be Mimeographed for Distribution)

I am interested in installing a water and plumbing system with the assistance of our cooperative. By check marks (X) below I am indicating the purpose for which I am thinking of using my water system and the assistance that I may need:

1. Uses of Water from the Water System:

- | | |
|--------------------------|-------------------------------------|
| a. Kitchen sink _____ | e. Bathroom _____ |
| b. Stock watering _____ | f. Fire protection _____ |
| c. Garden watering _____ | g. Lawn watering _____ |
| d. Milkhouse _____ | h. Stationary
laundry tubs _____ |

2. Equipment being considered:

- | | |
|---|---------------------------------------|
| a. Electric pump _____ | g. Water softener _____ |
| b. Bathroom fixtures _____ | h. Garden watering
equipment _____ |
| c. Electric water
heater _____ | i. _____ |
| d. Dairy water heater _____ | j. _____ |
| e. Kitchen sink _____ | k. _____ |
| f. Shower separate
from bathroom _____ | l. _____ |

3. Interested in a loan from the cooperative for financing the installation:
Yes _____ No _____

4. Interested in having a plumber make my installation:
Yes _____ No _____

5. Interested in training to make much or all of my own installation:
Yes _____ No _____

6. Interested in training to help neighbors make their installations:
Yes _____ No _____

7. Any comments you would like to make: _____

Name _____

Address _____

(Returning this questionnaire does not obligate you in any way.)

APPENDIX 'B'

THE EMPLOYMENT AND DUTIES OF THE ELECTRIFICATION ADVISER IN CHARGE OF THE PLUMBING PROGRAM

His Employment

The electrification adviser in charge of the plumbing program should be a full time employee of the cooperative. Unless the cooperative is very small, adequate handling of the work will require that he give a large part of his time to the plumbing program. His services will likely be needed for a period of several years. He must be qualified to perform the duties outlined below and such other emergency duties as may be necessary in a Water System and Plumbing Program. He will work under the direction and general supervision of the manager.

His Duties

1. To assist the manager with appropriate publicity and meetings with members.
2. To contact and negotiate with local plumbers and other workmen to locate and make available adequate sources of labor for making installations.
3. To organize and carry out a program for training workers to make installations if local supplies of trained workers are not adequate.
4. To select types of materials and equipment and to prepare "Unit Packages" on which suppliers quote prices.
5. To assist the manager in contacts with dealers and other sources of materials.
6. To check with members on the accuracy of their decisions. (For example - do they need shallowwell type or deep well type pumps? Is a jet type pump suitable? - size of pumps? - equipment needed? - location and size of septic tank and layout of disposal field? - etc.)
7. To conduct and supervise demonstrations for training workers and members, and for encouraging participation by members
8. To supervise member committee activities, and assist them by explaining the program and helping them with neighbors whom they are trying to interest.

9. To be responsible for assigning or "booking" cooperating workers so that they will be available where and when needed.
10. To assemble and check members' orders for materials - see that final correct orders are placed.
11. To keep an accurate list of all requests for water and plumbing systems and to spot these requests on maps (A red check might indicate a request, a blue check delivery of material, a green check assignment of a worker, a black check completion and inspection of the job.)
12. To have charge of tools, septic tank forms, and other equipment which the cooperative may provide for its members.
13. To supervise the construction of drain tile or other supplies which the cooperative may provide.
14. To inspect completed installations and make inspection reports for the cooperative's files, or to supervise the activities of the inspector.

APPENDIX 'C'

MATERIAL IN "UNIT PACKAGES"

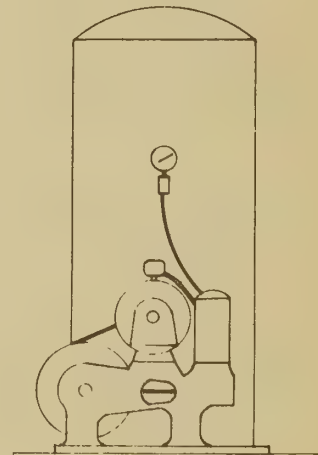
Prices on plumbing equipment should be on a basis of complete "unit packages" which include all fittings, faucets and other equipment necessary for the installation, connection, and use of the units when installed in a plumbing system. Too often many items are omitted from quotations and, therefore, the quoted price gives a false impression of the final cost.

It is desirable that the members be sold those "packages" which most nearly fit their individual situations. They will then be responsible for obtaining the ~~small~~ amount of supplementary supplies that may be required for their particular installations.

Below is listed equipment that should be included in "unit packages" on typical installations. The needs for accessory equipment may vary somewhat with different styles of equipment, equipment of different manufacturers, and the requirements of different plumbing laws and codes, but these lists will at least serve as a guide to the cooperative in making up suitable "unit packages" for its own use.

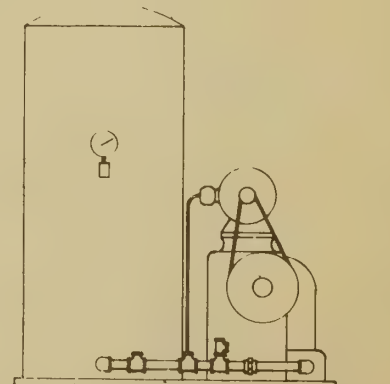
I. Shallow Well Pumps (All types except jet)

1. Pump
2. Motor
3. Pressure storage tank
4. Automatic or manually reset overload switch
5. Air volume control
6. Automatic pressure switch
7. Pressure gauge
8. Pressure relief valve
9. Foot valve
10. Fittings for connection
11. Three elbows of size to fit suction pipe
12. Suction pipe (priced on a unit length basis)



II. Deep Well Pumps (Reciprocating types)

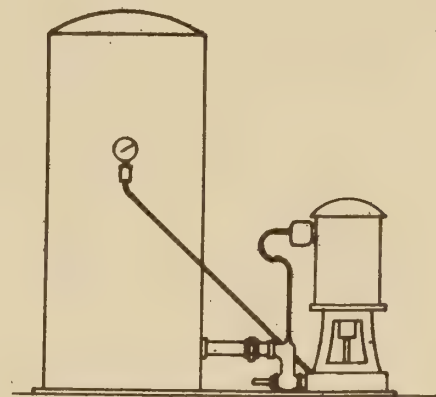
1. Pump including cylinder assembly
2. Motor
3. Pressure storage tank
4. Automatic or manually reset overload switch
5. Automatic pressure switch
6. Air volume control
7. Pressure gauge
8. Pressure relief valve



9. Check valve
10. Foot valve
11. Plunger rod (priced on a unit length basis)
12. Drop pipe (priced on a unit length basis)
13. Fittings for connection

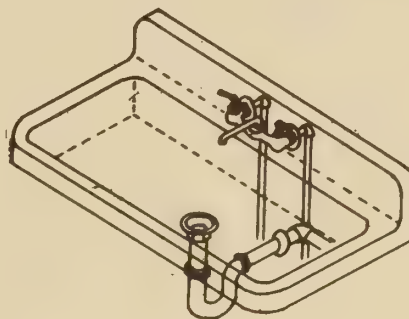
III. Jet Pumps

1. Combined pump and motor unit including jet assembly and control valve
2. Pressure storage tank
3. Automatic or manually reset overload switch
4. Automatic pressure switch
5. Air volume control
6. Pressure gauge
7. Foot valve
8. Elbows for three 90 degree bends in drive and delivery pipes to jet
9. Drive and delivery pipes to jet (priced on a unit length basis)



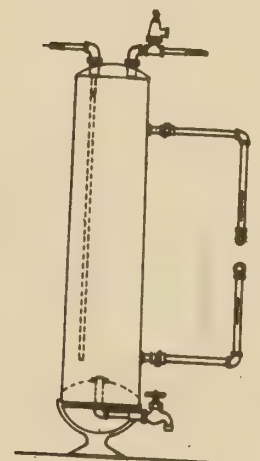
IV. Sinks

1. Sink
2. Strainer
3. Sink stopper
4. Faucets
5. Trap
6. Wall hangers (if wall type)
7. Fittings for connection to "roughing in"



V. Range Boilers

1. Boiler (hot water tank)
2. Boiler stand
3. Drain valve
4. Cold water tube
5. Two boiler unions
6. Pressure relief valve
7. Necessary fittings including two unions and at least eight feet of 3/4" pipe



VI. Water Heaters

A. For use with range boiler:

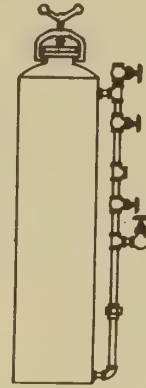
1. Complete heater (including stand if required), or water fronts or water backs to fit particular stoves in which they are to be installed.
2. Necessary pipe and fittings to connect stove or heater with range boiler

B. Electric Storage Heaters:

1. Unit tank and insulating jacket (with stand if required)
2. Necessary heating elements
3. Necessary thermostats
4. Proper electrical fittings and wiring connections
5. Drain fitting and valve
6. Temperature and pressure release valve

VII. Water Softeners

1. Tank
2. Softening agent (Zeolite) and necessary filtering sand and gravel
3. Necessary pipes, valves, and fittings for proper operation and connection to "roughing in"



VIII. Water Filters

(for removal of sediment, iron, tastes, odors or acidity)

1. Tank
2. Filtering agents
3. Necessary pipes, valves, and fittings for proper operation and connection to "roughing in"



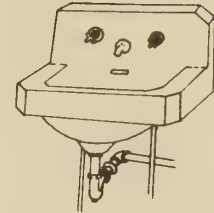
IX. Water Closets

1. Bowl
2. Tank (complete assembly)
3. Seat and cover
4. Bumpers, flanges and washers
5. Seat hinge
6. Attaching bolts, clamps and hangers
7. Supply pipe
8. Necessary fittings for complete installation and connection to "roughing in"



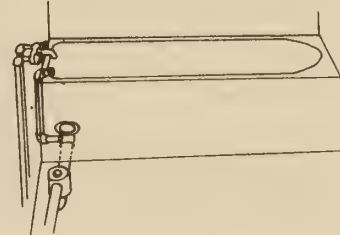
X. Lavatories

1. Lavatory
2. Faucets
3. Stopper, waste and overflow
4. Trap
5. Hangers
6. Supply pipes
7. Necessary fittings for complete installation and connection to "roughing in"



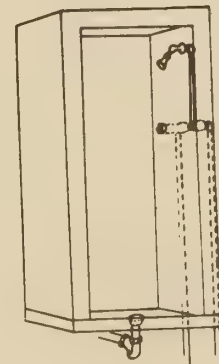
XI. Bathtubs

1. Tub
2. Faucets
3. Supply pipes
4. Waste and overflow including tail piece and stopper
5. Necessary fittings for complete installation and connection to "roughing in"



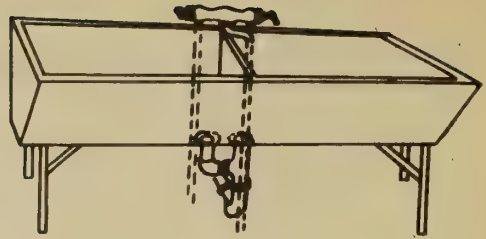
XII. Shower Stalls

1. Stall
2. Shower head
3. Valve
4. Curtain rod
5. Floor strainer
6. Necessary fittings and connections for complete installations and connection to "roughing in"



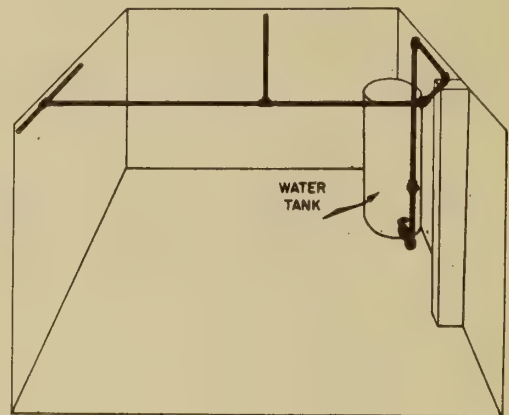
XIII. Laundry Tubs

1. Tub (including stand)
2. Strainers and stoppers
3. Faucets
4. Trap
5. Necessary fittings and connections for complete installation and connection to "roughing in"



XIV. Typical Bill of Material for Basement Cold Water Supply Main for Small Residence

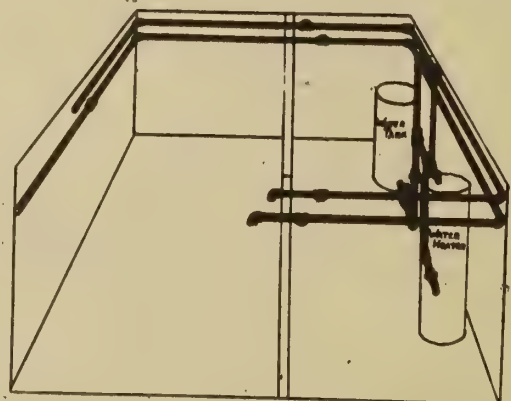
1. 20 ft. - $\frac{1}{2}$ " pipe
2. 20 ft. - $\frac{3}{4}$ " pipe
3. 4 - $\frac{1}{2}$ " 90 deg. elbows
4. 2 - $\frac{1}{2}$ " 45 deg. elbows
5. 1 - $\frac{1}{2}$ " union
6. 2 - $\frac{1}{2}$ " close nipples
7. 2 - $\frac{1}{2}$ " short nipples
8. 2 - $\frac{1}{2}$ " long nipples
9. 4 - $\frac{3}{4}$ " 90 deg. elbows
10. 2 - $\frac{3}{4}$ " 45 deg. elbows
11. 1 - $\frac{3}{4}$ " union
12. 2 - $\frac{3}{4}$ " close nipples
13. 2 - $\frac{3}{4}$ " short nipples
14. 2 - $\frac{3}{4}$ " long nipples
15. 1 - $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tee
16. 1 - $\frac{1}{2}$ " plug



17. 1 - $\frac{3}{4}$ " stop and drain valve
18. 1 - $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tee

XV. Typical Bill of Material for Basement Hot and Cold Water Supply Mains for Small Residence

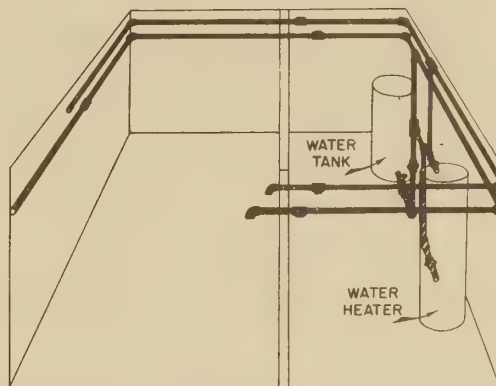
1. 40 ft. - $\frac{1}{2}$ " pipe
2. 40 ft. - $\frac{3}{4}$ " pipe
3. 8 - $\frac{1}{2}$ " 90 deg. elbows
4. 4 - $\frac{1}{2}$ " 45 deg. elbows
5. 2 - $\frac{1}{2}$ " unions
6. 4 - $\frac{1}{2}$ " close nipples
7. 4 - $\frac{1}{2}$ " short nipples
8. 4 - $\frac{1}{2}$ " long nipples
9. 8 - $\frac{3}{4}$ " 90 deg. elbows
10. 4 - $\frac{3}{4}$ " 45 deg. elbows
11. 3 - $\frac{3}{4}$ " unions
12. 4 - $\frac{3}{4}$ " close nipples
13. 4 - $\frac{3}{4}$ " short nipples
14. 4 - $\frac{3}{4}$ " long nipples
15. 2 - $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees
16. 2 - $\frac{1}{2}$ " plugs



17. 1 - $\frac{3}{4}$ " stop and drain valve
18. 1 - $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tee

**XVI. Typical Bill of Material for Basement Hot and Cold Water Supply
Mains for Larger Residence**

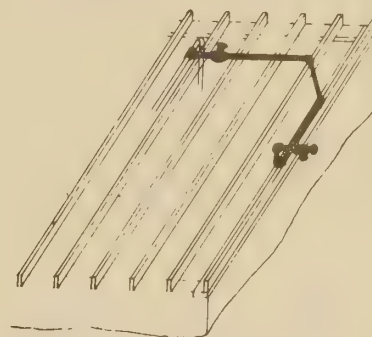
1. 60 ft. - $\frac{1}{2}$ " pipe
2. 60 ft. - $\frac{3}{4}$ " pipe
3. 12 - $\frac{1}{2}$ " 90 deg. elbows
4. 6 - $\frac{1}{2}$ " 45 deg. elbows
5. 3 - $\frac{1}{2}$ " unions
6. 6 - $\frac{1}{2}$ " close nipples
7. 6 - $\frac{1}{2}$ " short nipples
8. 6 - $\frac{1}{2}$ " long nipples
9. 12 - $\frac{3}{4}$ " 90 deg. elbows
10. 6 - $\frac{3}{4}$ " 45 deg. elbows
11. 3 - $\frac{3}{4}$ " unions
12. 6 - $\frac{3}{4}$ " close nipples
13. 6 - $\frac{3}{4}$ " short nipples
14. 6 - $\frac{3}{4}$ " long nipples
15. 3 - $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees
16. 3 - $\frac{1}{2}$ " plugs



17. 1 - $\frac{3}{4}$ " stop and drain valve
18. 3 - $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{2}$ " tees
19. 4 - $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{3}{4}$ " tees
20. 4 - $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tees

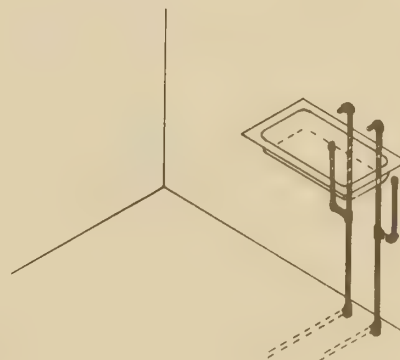
**XVII. Typical Bill of Material Required to Install a Sill Cock for an
Average Size Residence**

1. 1 - $\frac{1}{2}$ " sill cock
2. 20 ft. - $\frac{1}{2}$ " pipe
3. 2 - $\frac{1}{2}$ " 90 deg. elbows
4. 2 - $\frac{1}{2}$ " 45 deg. elbows
5. 4 - $\frac{1}{2}$ " short nipples
6. 1 - $\frac{1}{2}$ " stop and drain valve
7. 1 - $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{2}$ " tee
8. 1 - $\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ " tee



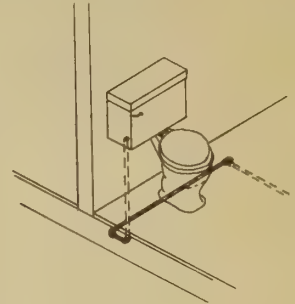
**XVIII. Typical Bill of Material for Hot and Cold Water Pipes from Basement
Mains to Sink on First Floor**

1. 10 ft. - $\frac{1}{2}$ " pipe
2. 4 - $\frac{1}{2}$ " tees
3. 2 - $\frac{1}{2}$ " plugs
4. 2 - $\frac{1}{2}$ " caps
5. 2 - $\frac{1}{2}$ " 90 deg. elbows
6. 2 - $\frac{1}{2}$ " close nipples
7. 2 - $\frac{1}{2}$ " short nipples
8. 2 - $\frac{1}{2}$ " street 90 deg. elbows



XIX. Typical Bill of Material for Cold Water Pipe from Basement Main to Water Closet on First Floor

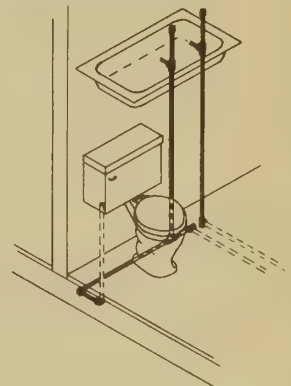
1. 5 ft. - $\frac{1}{2}$ " pipe
2. 2 - $\frac{1}{2}$ " 90 deg. elbows
3. 1 - $\frac{1}{2}$ " tee
4. 1 - $\frac{1}{2}$ " short nipple
5. 1 - $\frac{1}{2}$ " long nipple
6. 1 - $\frac{1}{2}$ " x $\frac{3}{8}$ " reducing 90 deg. elbow



For water closet on second floor add 10 ft. of $\frac{1}{2}$ " pipe to above bill of material.

XX. Typical Bill of Material for Hot and Cold Water Pipes from Basement Mains to Sink and Water Closet on First Floor

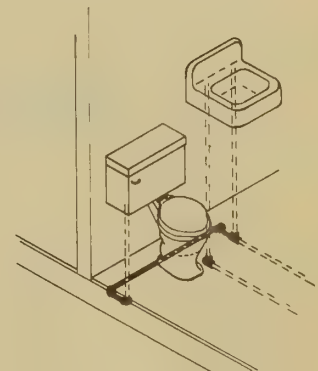
1. 10 ft. - $\frac{1}{2}$ " pipe
2. 5 - $\frac{1}{2}$ " tees
3. 2 - $\frac{1}{2}$ " plugs
4. 2 - $\frac{1}{2}$ " caps
5. 2 - $\frac{1}{2}$ " close nipples
6. 2 - $\frac{1}{2}$ " short nipples
7. 2 - $\frac{1}{2}$ " 90 deg. elbows
8. 1 - $\frac{1}{2}$ " x $\frac{3}{8}$ " 90 deg. elbows



For water closet on second floor add 10 ft. of $\frac{1}{2}$ " pipe to above bill of material.

XXI. Typical Bill of Material for Hot and Cold Water Pipes from Basement Mains to Lavatory and Water Closet on First Floor

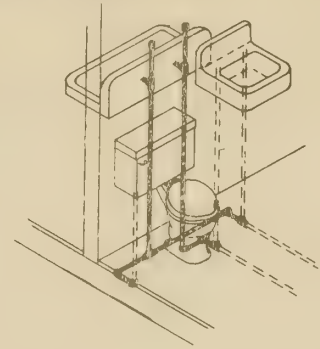
1. 10 ft. - $\frac{1}{2}$ " pipe
2. 5 - $\frac{1}{2}$ " tees
3. 2 - $\frac{1}{2}$ " plugs
4. 2 - $\frac{1}{2}$ " caps
5. 2 - $\frac{1}{2}$ " close nipples
6. 2 - $\frac{1}{2}$ " short nipples
7. 2 - $\frac{3}{8}$ " close nipples
8. 2 - $\frac{1}{2}$ " 90 deg. elbows
9. 3 - $\frac{1}{2}$ " x $\frac{3}{8}$ " 90 deg. elbows



For water closet and lavatory on second floor add 20 ft. of $\frac{1}{2}$ " pipe to above bill of material.

XXII. Typical Bill of Material for Hot and Cold Water Pipes from Basement
Mains to Water Closet, Lavatory and Sink on First Floor

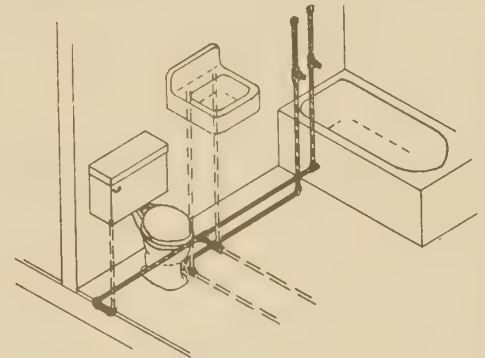
1.	15 ft.	-	$\frac{1}{2}$ "	pipe
2.	7	-	$\frac{1}{2}$ "	tees
3.	2	-	$\frac{1}{2}$ "	plugs
4.	2	-	$\frac{1}{2}$ "	caps
5.	4	-	$\frac{1}{2}$ "	close nipples
6.	4	-	$\frac{1}{2}$ "	short nipples
7.	2	-	$\frac{3}{8}$ "	close nipples
8.	4	-	$\frac{1}{2}$ "	90 deg. elbows
9.	3	-	$\frac{1}{2}$ " x $\frac{3}{8}$ "	90 deg. elbows



For water closet and lavatory on second floor
add 20 ft. of $\frac{1}{2}$ " pipe to above bill of material.

XXIII. Typical Bill of Material for Hot and Cold Water Pipes from Basement
Mains to Water Closet, Lavatory and Bath on First Floor

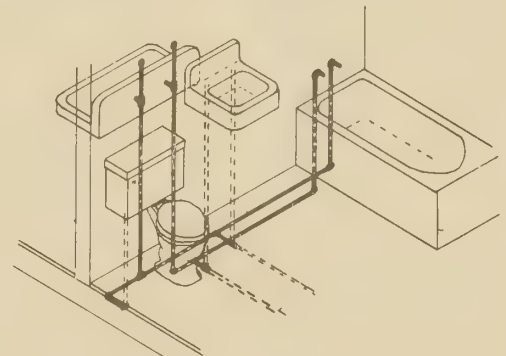
1.	15 ft.	-	$\frac{1}{2}$ "	pipe
2.	7	-	$\frac{1}{2}$ "	tees
3.	2	-	$\frac{1}{2}$ "	plugs
4.	2	-	$\frac{1}{2}$ "	caps
5.	3	-	$\frac{1}{2}$ "	close nipples
6.	3	-	$\frac{1}{2}$ "	short nipples
7.	3	-	$\frac{1}{2}$ "	long nipples
8.	6	-	$\frac{1}{2}$ "	90 deg. elbows
9.	3	-	$\frac{1}{2}$ " x $\frac{3}{8}$ "	90 deg. elbows



For fixtures located on second floor add 20 ft.
of $\frac{1}{2}$ " pipe to above bill of material.

XXIV. Typical Bill of Material for Hot and Cold Water Pipes from Basement
Mains to Sink, Water Closet, Lavatory and Bath on First Floor

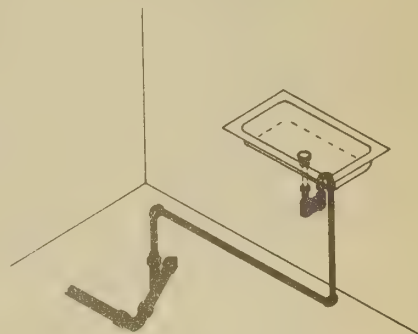
1.	20 ft.	-	$\frac{1}{2}$ "	pipe
2.	9	-	$\frac{1}{2}$ "	tees
3.	2	-	$\frac{1}{2}$ "	plugs
4.	2	-	$\frac{1}{2}$ "	caps
5.	4	-	$\frac{1}{2}$ "	close nipples
6.	4	-	$\frac{1}{2}$ "	short nipples
7.	4	-	$\frac{1}{2}$ "	long nipples
8.	7	-	$\frac{1}{2}$ "	90 deg. elbows
9.	2	-	$\frac{3}{8}$ "	close nipples
10.	3	-	$\frac{1}{2}$ " x $\frac{3}{8}$ "	90 deg. elbows



For one or more fixtures on second floor add 20 ft. of
 $\frac{1}{2}$ " pipe to above bill of material.

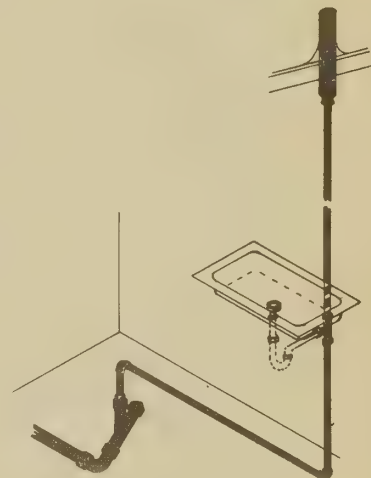
XXV. Typical Bill of Material for Sink Drain Without Vent. Sink on First Floor (Drain outside of house not included.)

1. 5 ft. - 2" soil pipe
2. 1 - 2" 1/8 bend
3. 1 - 2" x 2" Y branch
4. 1 - 2" clean-out plug
5. 1 - 1 1/2" tapped ferrule
6. 5 lb. - caulking lead
7. 1 lb. - oakum
8. 10 ft. - 1 1/2" waste pipe
9. 1 - 1 1/2" short nipple
10. 1 - 1 1/2" long nipple
11. 2 - 1 1/2" drainage 45 deg. elbows
12. 1 - 1 1/2" anti-siphon trap
13. 1 - 1 1/2" friction nut



XXVI. Typical Bill of Material for Sink Drain with Vent Stack. Sink on First Floor of one Story House (Drain outside of house not included)

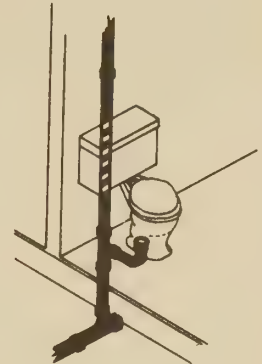
1. 5 ft. - 2" soil pipe
2. 1 - 2" 1/8 bend
3. 1 - 2" x 2" Y branch
4. 1 - 2" clean-out plug
5. 1 - 1 1/2" tapped ferrule
6. 5 lb. - caulking lead
7. 1 lb. - oakum
8. 20 ft. - 1 1/2" waste and vent pipe
9. 1 - 1 1/2" short nipple
10. 1 - 1 1/2" long nipple
11. 2 - 1 1/2" drainage 45 deg. elbows
12. 1 - 1 1/2" drainage hub top tee
13. 1 - 2" x 1 1/2" bushing
14. 1 - 2" x 3" x 24" tapped increaser
15. 1 - 3" roof flashing



For two story building add 10 ft. of 1 1/2" pipe,
2 - 1 1/2" drainage 45 deg. elbows, and 1 - 1 1/2"
long nipple to above bill of material

XXVII. Typical Bill of Material for Soil Stack, Soil Pipe and House Drain for Water Closet on First Floor of One Story House. (Sewer outside of house not included.)

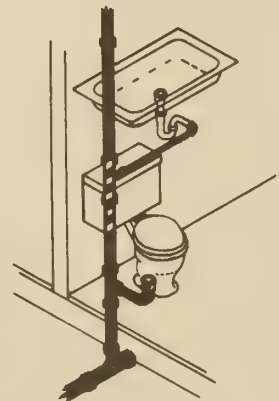
1. 10 ft. - 3" single hub soil pipe
2. 10 ft. - 3" double hub soil pipe
3. 1 - 3" stack base fitting with clean-out
4. 1 - 3" x 4" x 1½" double tapped sanitary tee
5. 1 - 4" x 16" closet bend
6. 1 - 4" x 2½" closet collar and bolts
7. 1 - 3" roof flashing
8. 35 lb. - caulking lead
9. 3 lb. - oakum
10. 2 - 1½" plugs
11. 10 ft. - hanger iron
12. 1 - Closet outlet gasket



For two story house with water closet on first or second floor add 10 ft. of single hub soil pipe to above bill of material.

XXVIII. Typical Bill of Material for Soil Stack, Waste Pipes, and House Drain for Water Closet and Sink on First Floor of One Story House. (Sewer outside of house not included)

1. 10 ft. - 3" single hub soil pipe
2. 10 ft. - 3" double hub soil pipe
3. 1 - 3" stack base fitting with clean-out
4. 1 - 3" x 4" x 1½" double tapped sanitary tee
5. 1 - 4" x 16" closet bend
6. 1 - 4" x 2½" closet collar and bolts
7. 1 - 3" x 1½" tapped sanitary tee
8. 1 - 3" roof flashing
9. 35 lb. - caulking lead
10. 3 lb. - oakum
11. 10 ft. - hanger iron
12. 2 - 1½" plugs
13. 1 - 1½" short nipples
14. 1 - 1½" long nipples
15. 10 ft. - 1½" waste pipe
16. 1 - closet outlet gasket



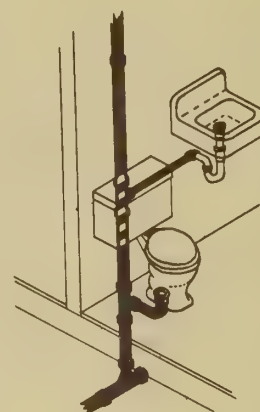
For two story house with fixtures on first floor add 10 ft. of single hub soil pipe to above bill of material.

For two story house with water closet on second floor
add the following to the above bill of material:

1. 10 ft. - 3" single hub soil pipe	6. 1	- 1½" drainage hub top tee
2. 15 ft. - 1½" waste and vent pipe	7. 1	- 1½" drainage 90 deg. elbow
3. 1 - 3" x 2" Y branch	8. 2	- 1½" close nipples
4. 1 - 1½" tapped ferrule	9. 2	- 1½" short nipples
5. 1 - 1½" drainage 45 deg. elbow	10. 2	- 1½" long nipples

XXIX. Typical Bill of Material for Soil Stack, Waste Pipes and House Drain for Water Closet and Lavatory on First Floor of One Story House.
(Sewer outside of house not included.)

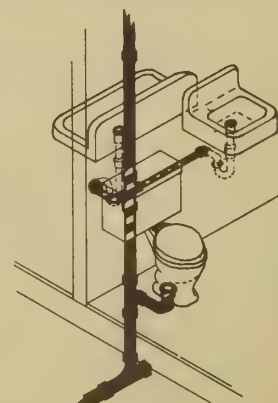
1. 10 ft. - 3" single hub soil pipe		
2. 10 ft. - 3" double hub soil pipe		
3. 1 - 3" stack base fitting with clean-out		
4. 1 - 3" x 4" x 1½" double tapped sanitary tee		
5. 1 - 4" x 16" closet bend		
6. 1 - 4" x 2½" closet collar and bolts		
7. 1 - 3" x 1½" tapped sanitary tee		
8. 1 - 3" roof flashing		
9. 35 lb. - caulking lead		
10. 3 lb. - oakum		
11. 10 ft. - hanger iron	15. 1	- 1½" close nipple
12. 2 - 1½" plugs	16. 1	- closet outlet gasket
13. 4 ft. - 1½" waste pipe	17. 1	- 1½" short nipple
14. 1 - 1½" drainage 90 deg. elbow	18. 1	- 1½" long nipple



For two story house with fixtures on first or second floor add 10 ft. of single hub soil pipe to above bill of material.

XXX. Typical Bill of Material for Soil Stack, Waste Pipes and House Drain for Water Closet, Lavatory, Sink on First Floor of One Story House.
(Sewer outside of house not included.)

1. 10 ft. - 3" single hub soil pipe		
2. 10 ft. - 3" double hub soil pipe		
3. 1 - 3" stack base fitting with clean-out		
4. 1 - 3" x 4" x 1½" double tapped sanitary tee		
5. 1 - 4" x 16" closet bend		
6. 1 - 4" x 2½" closet collar and bolts		



7.	1	- 3" x 1½" tapped sanitary cross	13.	4 ft.	- 1½" waste pipe
8.	1	- 3" roof flashing	14.	2	- 1½" drainage 90 deg. elbows
9.	35 lb.	- caulking lead	15.	2	- 1½" close nipples
10.	3 lb.	- oakum	16.	1	- closet outlet gasket
11.	10 ft.	- hanger iron	17.	2	- 1½" short nipples
12.	2	- 1½" plugs	18.	2	- 1½" long nipples

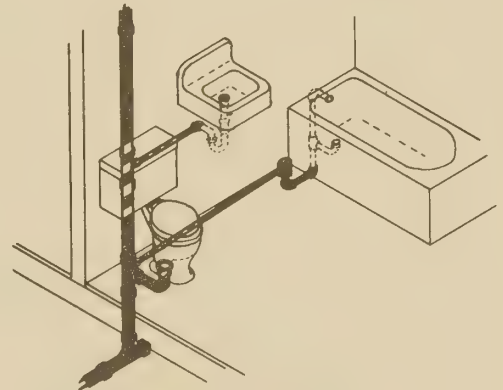
For two story house with fixtures on first floor add 10 ft. of single hub soil pipe to above bill of material.

For two story house with water closet and lavatory on second floor add the following to the above bill of material.

1.	10 ft.	- 3" single hub soil pipe	6.	1	- 1½" drainage 45 deg. elbow
2.	15 ft.	- 1½" waste and vent pipe	7.	1	- 1½" drainage hub top tee
3.	1	- 3" x 2" Y branch	8.	1	- 1½" drainage 90 deg. elbow
4.	2	- 3" x 1½" tapped sanitary tees	9.	2	- 1½" close nipples
5.	1	- 1½" tapped ferrule	10.	2	- 1½" short nipples
			11.	2	- 1½" long nipples

XXXI. Typical Bill of Material for Soil Stack, Waste Pipe and House Drain for Water Closet, Lavatory, and Bath on First Floor of One Story House. (Sewer outside of house not included.)

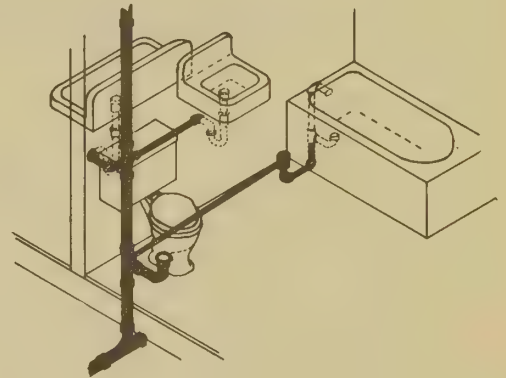
1	10 ft.	- 3" single hub soil pipe			
2.	10 ft.	- 3" double hub soil pipe			
3.	1	- 3" stack base fitting with clean-out			
4.	1	- 3" x 4" x 1½" double tapped sanitary tee			
5.	1	- 4" x 16" closet bend			
6.	1	- 4" x 2½" closet collar and bolts			
7.	1	- 3" x 1½" tapped sanitary tee			
8.	1	- 3" roof flashing			
9.	35 lb.	- caulking lead			
10.	3 lb.	- oakum			
11.	10 ft.	- hanger iron			
12.	1	- 1½" plug	16.	1	- 4" x 5" drum trap tapped 1½"
13.	10 ft.	- 1½" waste pipe	17.	2	- 1½" close nipples
14.	2	- 1½" drainage 45 deg. elbows	18.	2	- 1½" short nipples
15.	3	- 1½" drainage 90 deg. elbows	19.	2	- 1½" long nipples
			20.	1	- closet outlet gasket



For two story house with fixtures on first or second floor add 10 ft. of single hub soil pipe to above bill of material.

XXXII. Typical Bill of Material for Soil Stack, Waste Pipes and House Drain for Sink, Water Closet, Lavatory, and Bath on First Floor of One Story House. (Sewer outside of house not included.)

1. 10 ft. - 3" single hub soil pipe
2. 10 ft. - 3" double hub soil pipe
3. 1 - 3" stack base fitting
with clean-out
4. 1 - 3" x 4" x 1½" double
tapped sanitary tee
5. 1 - 4" x 16" closet bend
6. 1 - 4" x 2½" closet collar
and bolts
7. 1 - 3" x 1½" tapped sanitary
cross
8. 1 - 3" roof flashing
9. 35 lb. - caulking lead
10. 3 lb. - oakum
11. 10 ft. - hanger iron
12. 1 - 1½" plug
13. 10 ft. - 1½" waste pipe
14. 2 - 1½" drainage 45 deg. elbows
15. 5 - 1½" drainage 90 deg. elbows
16. 1 - 4" x 5" drum trap tapped 1½"
17. 3 - 1½" close nipples
18. 3 - 1½" short nipples
19. 3 - 1½" long nipples
20. 1 - closet outlet gasket



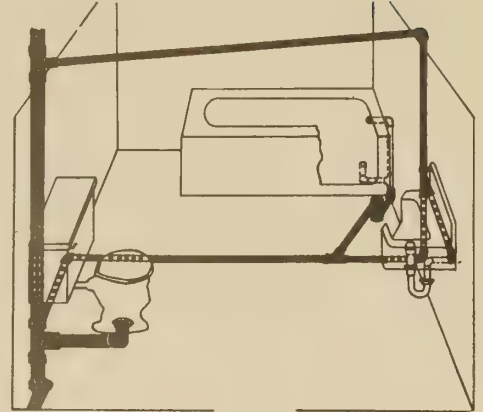
For two story house with fixtures on first floor add 10 ft. of single hub soil pipe to above bill of material.

For two story house with bathroom fixtures on second floor add the following to the above bill of material.

- | | |
|-------------------------------------|-----------------------------------|
| 1. 10 ft. - 3" single hub soil pipe | 6. 1 - 1½" drainage 45 deg. elbow |
| 2. 15 ft. - 1½" waste and vent pipe | 7. 1 - 1½" drainage hub top tee |
| 3. 1 - 3" x 2" Y branch | 8. 1 - 1½" drainage 90 deg. elbow |
| 4. 1 - 3" x 1½" tapped sanitary tee | 9. 2 - 1½" close nipples |
| 5. 1 - 1½" tapped ferrule | 10. 2 - 1½" short nipples |
| | 11. 2 - 1½" long nipples |

For bathtub and lavatory located on opposite side of bathroom from soil stack and water closet add the following to each of the above bills of material:

1. 20 ft. - $1\frac{1}{2}$ " waste and vent pipe
2. 1 - $1\frac{1}{2}$ " drainage 90 deg. elbow
3. 1 - $1\frac{1}{2}$ " drainage hub top tee
4. 1 - $1\frac{1}{2}$ " drainage Y



Fittings and other equipment in addition to those which are included in these typical bills of material and which are needed for individual installations may be bought on a unit basis.

APPENDIX 'D'

SUGGESTED PLUMBING INSPECTOR'S REPORT AND CERTIFICATE

A suggested form for the plumbing inspector's report and certificate is given below. Local conditions may make it desirable to alter this form somewhat but, in that case, it will serve as a useful guide in preparing a suitable form.

Ordinarily, the plumbing inspector's report and certificate should be prepared in triplicate - one copy for the property owner, one for the inspector's file, and one for the cooperative's or power district's file. If copies are to be given to health authorities, it may be necessary that they be prepared in quadruplicate or quintuplicate.

Plumbing Inspector's Report and Certificate

(To be duplicated by the cooperative or power district for its use)

(Name of cooperative or power district)

Installation on property of _____

Address _____

Installation made by _____

Address _____

I certify that I have inspected the water and plumbing system on the property indicated above, that it will serve the buildings and includes the equipment indicated by check (X) marks on the reverse side of this sheet, and, except as indicated by check marks on the reverse side of this sheet and noted below, that I found it in a satisfactory operating condition, installed in accord with all applicable requirements.

(Signature of Inspector)

Date: _____

Explanation of disapprovals and other remarks: _____

Buildings Served

Residence	:	Poultry Laying House	:	Laundry House	:	Brooder House	:
Milk House	:	Dairy Stable	:	Horse Stable	:	Machine Shed	:
Hog House	:	Farm Shop	:		:		:
	:		:		:		:

Equipment Installed

Items	No.:	Dis- approved:	Items	No.:	Dis- approved:
Pumps	:XXX:XXXXXXX:XXXXXXX:	:	Laundry tubs	:	:
Shallow well	:	:	Water softeners	:	:
Deep well (except jet)	:	:	Water filters	:	:
Deep well jet	:	:	Sill cocks	:	:
Other	:	:	Yard or stock tank hydrant:	:	:
Sinks	:	:	Livestock drinking cups	:	:
Bathtubs	:	:	Dairy water heaters	:	:
Shower baths	:	:	Septic tanks	:	:
Lavatories	:	:	Septic tank	:	:
Water closets	:	:	disposal fields	:	:
Range boilers	:	:		:	:
Electric storage heaters	:	:		:	:
Cold water piping	:XXX:	:		:	:
Hot water piping	:XXX:	:		:	:
Waste piping system	:	:		:	:

APPENDIX 'E'

SELECTION OF ELECTRIC PUMPS FOR FARM WATER SYSTEMS

The needs of farm families in most areas vary sufficiently so that it is desirable to offer them a selection of 6 different pumps-- 2 sizes in each of 3 types.

The use of a pressure tank with the pump is definitely to be recommended for general farm use. While "direct connected" pumps are somewhat lower in first cost, they are subject both to higher operating and to higher maintenance costs. In general, pressure tanks with at least 42 gallons capacity are to be preferred.

Sizes of Pumps

Some degree of fire protection is one of the advantages that practically all farm families hope to obtain from their electric water systems. An ordinary 3/4-inch garden hose is capable of delivering about 300 gallons of water per hour at usual working pressures. This amount of water will not stop a raging fire but it would be very valuable if the fire was discovered in its early stages. It is also sufficient to water a small vegetable garden. For these reasons, it is desirable, if the water supplies are adequate, to install pumps that will actually deliver 300 gallons per hour. To obtain this amount of water under usual conditions, the rated capacity of the pump should be at least 340 gallons per hour.

Many water supplies are not capable of furnishing 300 gallons of water per hour. In these situations, the slightly cheaper, smaller pumps are to be recommended even though this seriously limits the usefulness of the systems.

Considering the reasons given above and the ordinary daily needs for water, it is usually desirable to offer a choice of a minimum size pump having a rated capacity of from 180 to 250 gallons of water per hour and a larger pump having a rated capacity between 340 and 375 gallons per hour. In areas having ample water supplies and large dairy herds or truck patches up to an acre in size, which need irrigation, it may be desirable to offer an even larger pump having a rated capacity of near 500 gallons per hour.

If the water supply is adequate, 1 to 2 hours of pumping should furnish the entire daily needs.

Types of Pumps

Three types of pumps are necessary to meet the needs of all farmers in most areas, although wells in some areas may be sufficiently uniform so that one or two of these types may be eliminated from consideration.

1. Shallow Well Pumps - As a general rule, this type of pump is to be preferred in wells in which the suction lift is less than 22 feet (at sea level). On a basis of 22 feet suction lift at sea level, the following table gives the suction lift of shallow well pumps at different altitudes:

<u>Altitude Above Sea Level</u>	<u>Suction Lift of Pump</u>
Sea Level	22 ft.
1/4 mi., (1,320 ft.)	21 ft.
1/2 mi., (2,640 ft.)	20 ft.
3/4 mi., (3,960 ft.)	18 ft.
1 mi., (5,280 ft.)	17 ft.
1 1/4 mi., (6,600 ft.)	16 ft.
1 1/2 mi., (7,920 ft.)	15 ft.
2 mi., (10,560 ft.)	14 ft.

Different styles of shallow well pumps and the pumps of different manufacturers vary from about 15 feet to 28 feet in their practical suction lifts (at sea level) so that the figure of 22 feet can be used as an estimate only until a particular pump has been selected.

Shallow well pumps are cheaper than deep well pumps. They are entirely satisfactory in locations where the water level is never deeper than has been indicated above.

2. Reciprocating Deep Well Pumps - Conventional reciprocating (including differential) deep well pumps have the cylinders or other actual pumping mechanisms lowered into the wells so that they are within 22 feet of the water. (The cylinders are usually submerged in the water.) For this reason they may be used in wells of any depth. The driving mechanisms must be adapted to the depths of the wells and the volumes of water handled. They must be directly over the water supplies. This frequently requires the construction of pump houses or pits over the wells for the protection of the machinery. As a general recommendation, these pumps are to be preferred in wells where the depth to water is more than 80 feet.
3. Jet Pumps - Pumps of this type are relatively new. They are made as both shallow well and deep well pumps. Deep well jet pumps are to be recommended in locations where the suction lift is between 22 feet and 80 feet. The driving mechanism need not be located directly over the well. These pumps will operate where the suction lifts are considerably greater than

80 feet, but their efficiency decreases so fast with increased depth that it is usually more economical, with greater depths, to use conventional deep well reciprocating pumps and to build pump houses over the wells for the protection of the pumps. These pumps are very efficient with low lifts and are a satisfactory type of shallow well pump.

ADDITIONAL POINTS TO CONSIDER

1. It is often desirable to install a pump which is capable of pumping from the bottom of the well even though the water level may normally be much higher.
2. Do not install a pump in a well which lacks sufficient water for the pump's normal operation. The owner probably knows the condition of his well better than anyone else, but the matter of sufficient water should be called to his attention.
3. In figuring capacities, do not overlook the friction of the water in the pipe. If the suction pipe to a pump is over 50 feet long, it is advisable to deduct one foot from the estimated suction lift for each 25 feet beyond 50 feet. To reduce this friction loss it is often desirable to increase the size of the suction pipe if it is over 100 feet long.
4. All pump motors should be equipped with overload protection. Many pumps have been condemned by the owners because the motors burned out, when the cause of the trouble was an overloaded or inadequate wiring circuit.
5. Whenever practical, electric service wires to the pump should be from the yard pole, not from the house. The pump motor is then isolated from overloaded house circuits, and in case of fire in the house, will continue to operate after the fire has destroyed the wiring in the house.

Common Water Requirements When Water Under Pressure is Available.

<u>Use</u>	<u>Quantity</u>
Each member of family	35 gal. per day
Each cow	35 gal. per day
Each horse	15 gal. per day
Each hog	2 gal. per day
Each sheep	1½ gal. per day
Each 100 chickens	3 gal. per day
¾" garden hose	300 gal. per hour
⅝" garden hose	200 gal. per hour

Common Rates of Water Flow

To bath	10 gal. per minute
To lavatory	5 gal. per minute
To water closet tank	5 gal. per minute
To shower	5 gal. per minute
To sink	10 gal. per minute
To laundry tub	10 gal. per minute
Through garden hose (3/4")	5 gal. per minute
Through garden hose (5/8")	4 gal. per minute

APPENDIX 'F'

SEPTIC TANK CONSTRUCTION

- I. Determine the state and local laws and regulations that apply.
- II. Obtain plans and recommendations from the state Agricultural Extension Service (County Agricultural Agents and County Home Demonstration Agents) or the state college of agriculture. These should conform with the state laws and regulations.
- III. Insofar as they are in accord with health authority requirements and the recommendations of the Agricultural Extension Service and the state college of agriculture, the following specifications should be followed ("Minimum Requirements for Plumbing Financed with REA Funds, Form AL-73" must be used as the specification for each installation financed with REA funds):

1. Minimum size of the septic tank should be 500 gallons "working" capacity (capacity below liquid level) plus 60 gallons "working" capacity for each person over four normally served. Minimum depth of liquid should be at least 48 inches. The direction of flow through the tank should be parallel to the length of the tank and the length should be not less than two or more than three times the width.

A common size is 6 feet long, 3 feet wide, and 5 feet deep (inside measurements). A tank of this size with one foot of freeboard has approximately 540 gallons "working" capacity.

Sludge accumulates in the tank at a rate of about 20 gallons per person per year. The sludge accumulation from a family of five will thus decrease the capacity of the tank about 100 gallons per year.

2. The tank may be cast-in-place concrete, precast concrete, tile, or steel construction. Cast-in-place concrete for the walls and floor of the tank should have a thickness of at least 4 inches. Precast concrete should have a thickness of at least 1½ inches and should be adequately reinforced to withstand all strains to which it will normally be subjected.

Concrete septic tank covers should be at least 4 inches thick and should be adequately reinforced with steel to withstand a dead weight of at least 150 pounds per square foot. Covers may be made in sections from 20

inches to 24 inches wide extending across the tank, each section being reinforced with 3 one-fourth inch steel reinforcing rods laid the long way of the section. The covers should be grouted in place with a stiff mixture of portland cement and water. Not more than 6 gallons of water with each sack of cement should be used in making the concrete. Since there is some moisture in the sand, this will require the addition of not more than 5 gallons of water with average wet sand. If it is mixed and cured properly this will produce concrete that is watertight.

With cast-in-place concrete, a 1-2 $\frac{1}{4}$ -3 mixture with clean sharp sand and gravel will frequently be of the right consistency. To insure watertightness, the amount of sand and gravel, not the amount of water, should be varied to produce the correct consistency. The mixture should be stiff, never sloppy, and free water appearing on the surface indicates that more sand or gravel or both should have been used. The maximum size of the gravel should be about 1 $\frac{1}{2}$ inches.

The thickness of the steel in steel septic tanks should be not less than No. 12 B&S gauge. (It is estimated that No. 12 gauge tanks have a probable life of 10 to 15 years.) Steel tanks should be thoroughly coated inside and out with asphaltum or other equally efficient water-proofing material.

3. It may be desirable to provide one or more small openings in the septic tank cover through which the suction pipe from a pitcher pump may be inserted to pump out the accumulated sludge.
4. The inlet to the tank should be at least 4 inches in diameter and should end in either a Y, a T, or an L fitting. If the incoming sewage is not directed vertically downward by the end fitting, the tank should be provided with at least one baffle extending at least 18 inches below and 6 inches above the liquid surface and so placed as to prevent undue agitation of the sewage in the tank by the incoming sewage.
5. The discharge opening of the inlet should be below the liquid surface in the tank.
6. A vent hole at least one inch in diameter should be provided in the top of the bend of the inlet fitting.

7. The outlet of the tank should be either a Y, a T, or an L fitting, at least 4 inches in diameter with the opening through which the sewage enters the outlet at least 16 inches below the liquid surface. It should be provided with a vent hole at least one inch in diameter at its highest point opening into the tank above the liquid surface. The outlet should be at least two inches but not more than four inches lower than the incoming sewage line.
8. Air space from the liquid level to the top of the tank should be at least 12 inches deep.
9. The disposal field, in most areas of the country, should have at least 150 feet of drain tile laid about 18 inches below the surface of the ground. In heavy soils more than this amount of tile will be required. A percolation test is best for determining the needed amount of tile. Broken stone or gravel to a depth of at least six inches should be placed beneath the disposal tile. The maximum length of tile lines should not exceed 100 feet, and at least two tile lines will be needed in each disposal field.
10. The disposal lines should have a slope of from two inches to four inches per 100 feet.
11. All parts of the sewage system within 100 feet of the water supply must be watertight construction. This is a general specification and the distance may need to be increased considerably if the land slopes toward the water supply or the subsurface seepage of the sewage is toward the water supply.

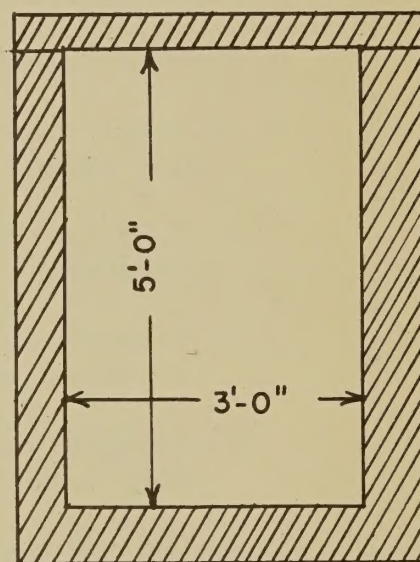
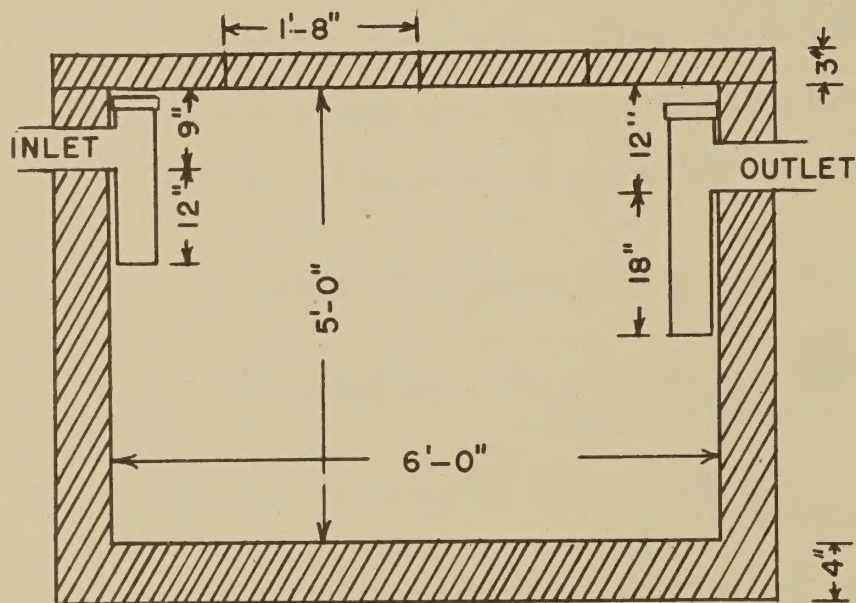
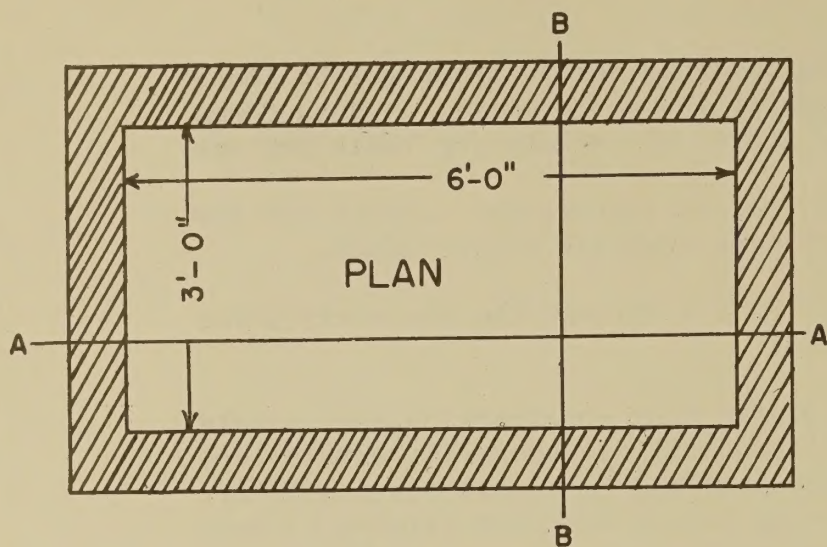
IV. Several possible methods may be used in obtaining the septic tanks.

It is well to remember that member participation in any cooperative activity has certain definite desirable results even when not accompanied by a cash saving. The methods that involve maximum member participation are preferred therefore, unless other methods offer substantial reductions in cost or substantially higher quality.

Methods

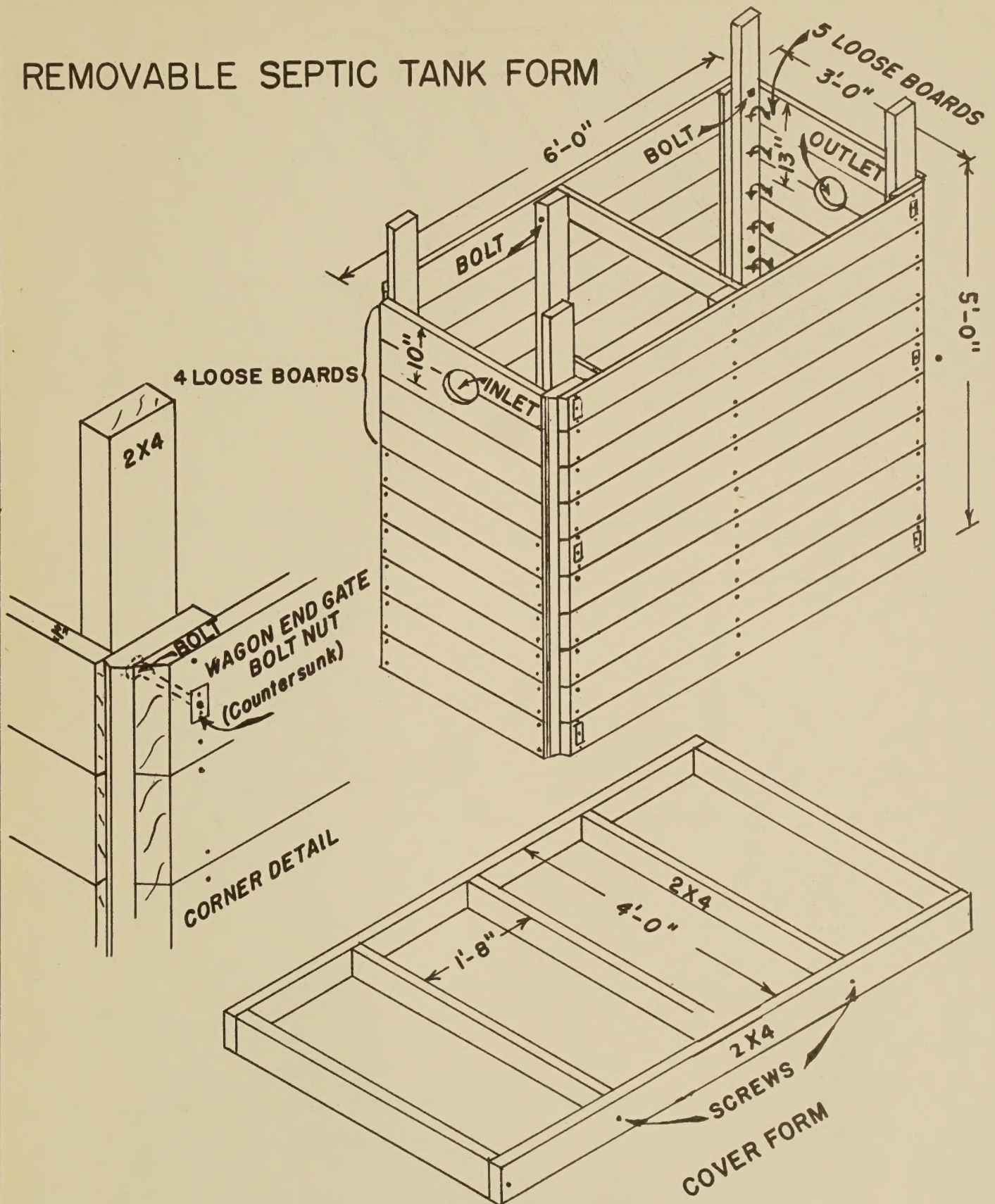
1. Each member may be responsible for his own septic tank without assistance other than advice from the cooperative.

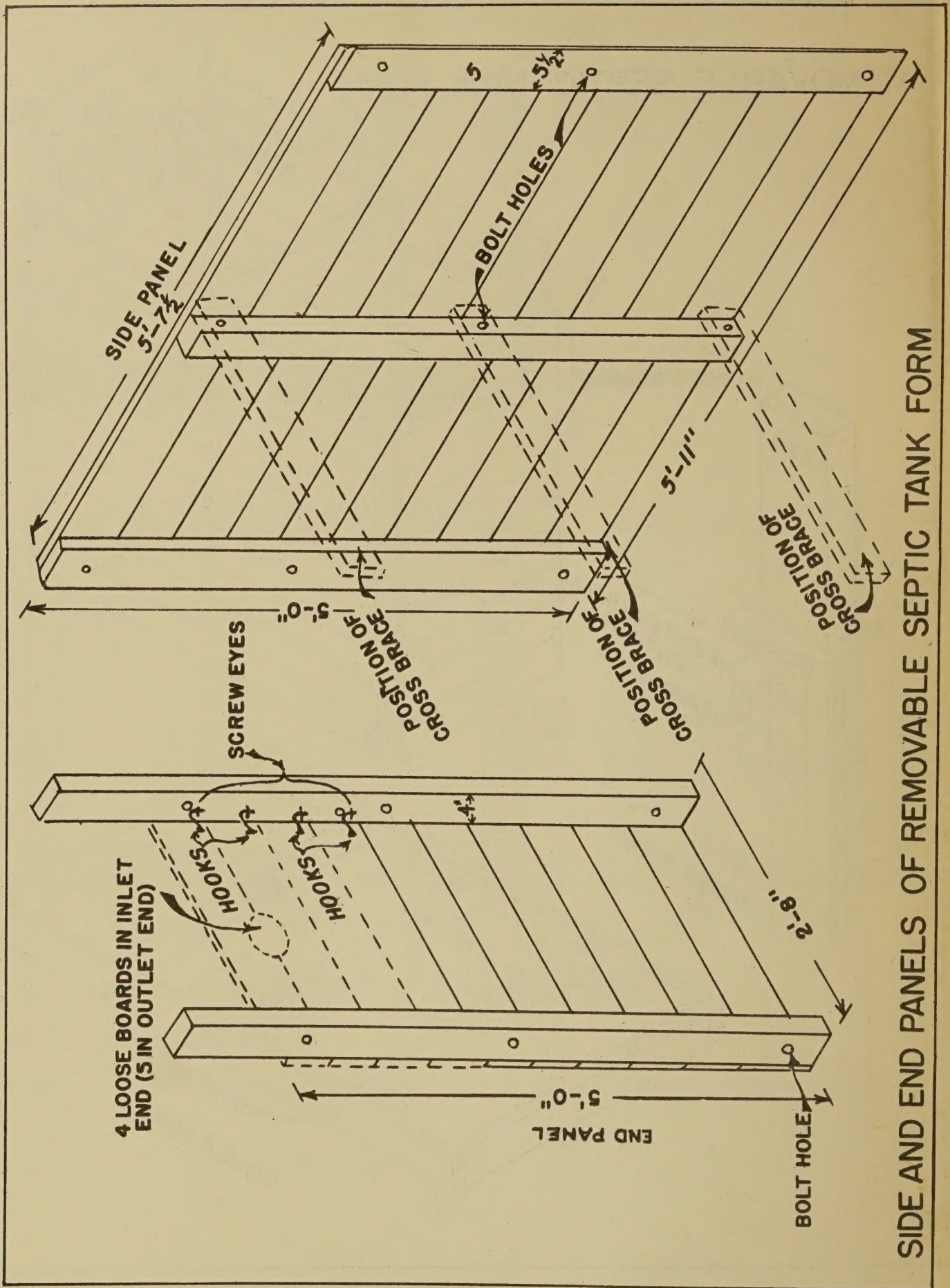
2. Portland cement may be purchased cooperatively and each member held responsible for the construction of his own septic tank.
3. Removable forms for concrete septic tanks may be loaned or rented to members by the cooperative, or such forms may be provided by groups of members for their own use.
4. Group contracts may be let through the cooperative for the construction of cast-in-place septic tanks.
5. Group contracts may be let through the cooperative for precast septic tanks.
6. Demonstrations in septic tank construction may be held at various points throughout the cooperative territory. Cement and other supplies may be bought cooperatively, and tools and concrete mixers may be furnished to members for a small rental fee.
7. Steel septic tanks may be bought under group purchase.
8. Various combinations of the above methods may be used.
9. Tile for the disposal fields may be obtained in the following ways:
 - a. Concrete or clay tile may be bought under group purchase.
 - b. Concrete or clay tile may be made under contract by some local firm or individual.
 - c. Concrete tile may be made by the cooperative and sold to the members.
 - d. The cooperative may rent tile making machines to individual members or groups of members who, with adequate supervision, would make their own tile.



CONCRETE SEPTIC TANK

REMOVABLE SEPTIC TANK FORM





SIDE AND END PANELS OF REMOVABLE SEPTIC TANK FORM